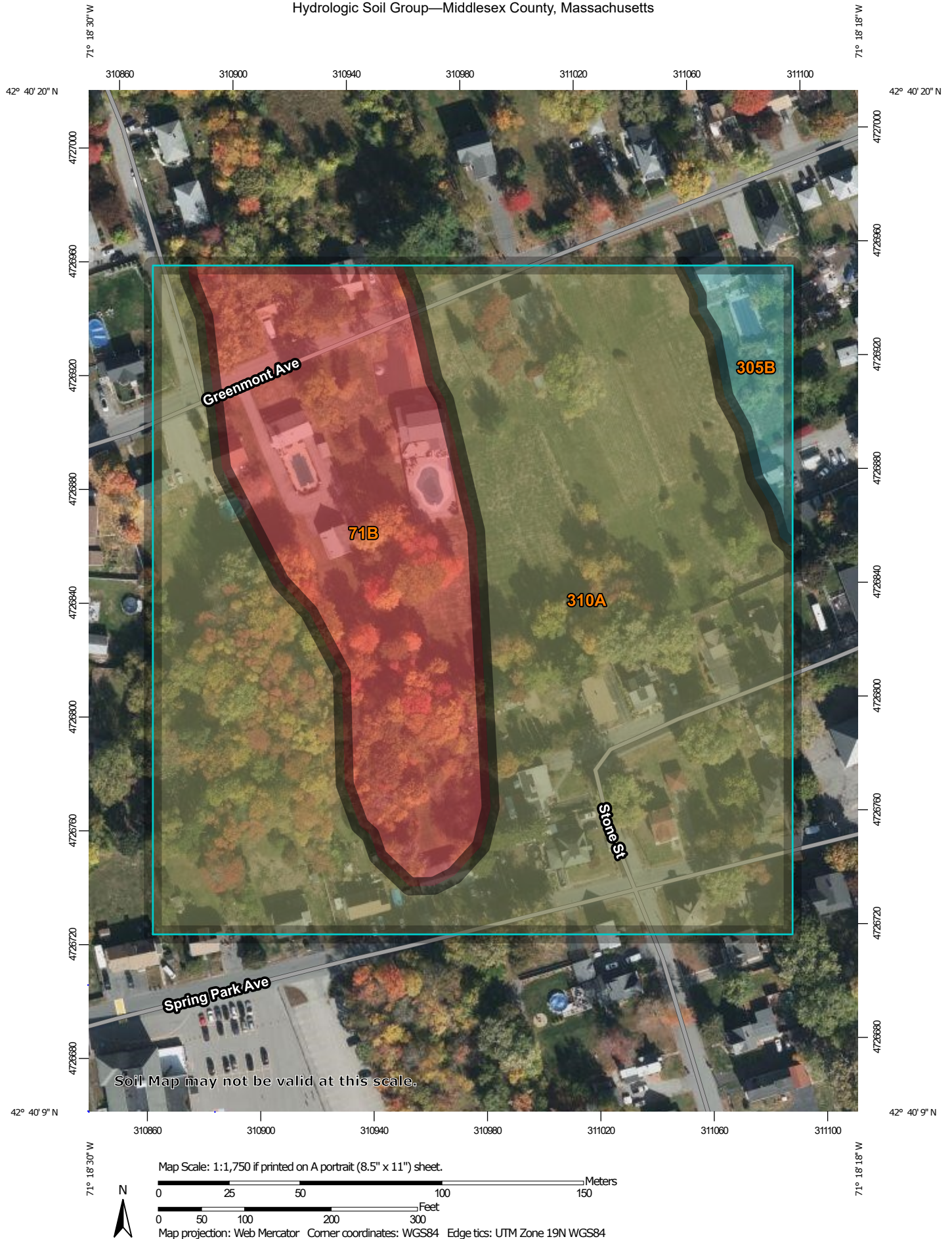


Hydrologic Soil Group—Middlesex County, Massachusetts

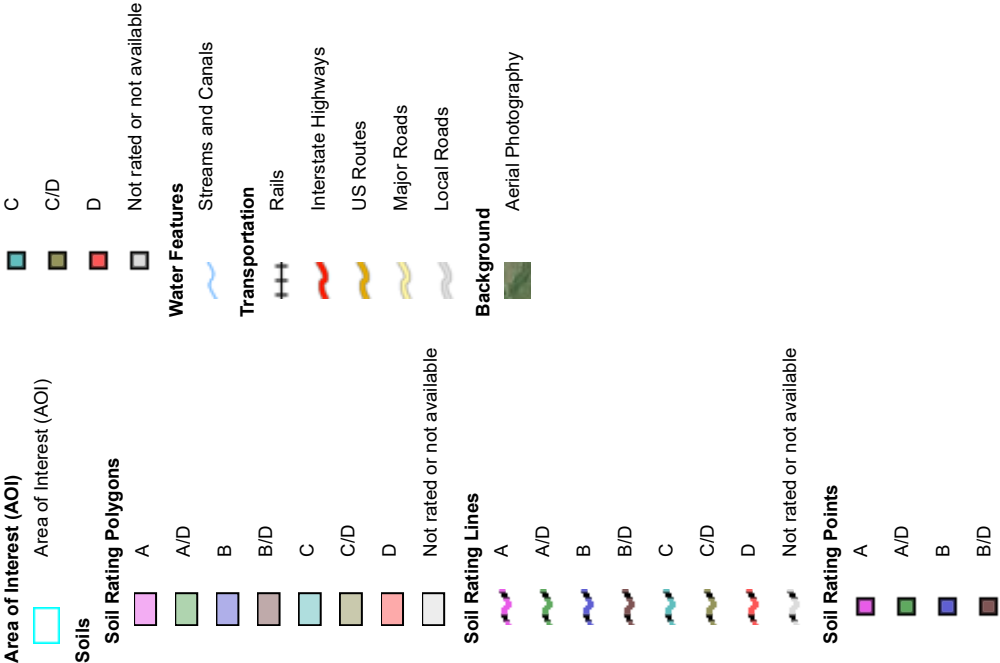


**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

3/30/2022
Page 1 of 4

MAP LEGEND



MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 21, Sep 2, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 4, 2020—Oct 19, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	D	3.5	26.3%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	0.5	3.9%
310A	Woodbridge fine sandy loam, 0 to 3 percent slopes	C/D	9.2	69.8%
Totals for Area of Interest			13.2	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

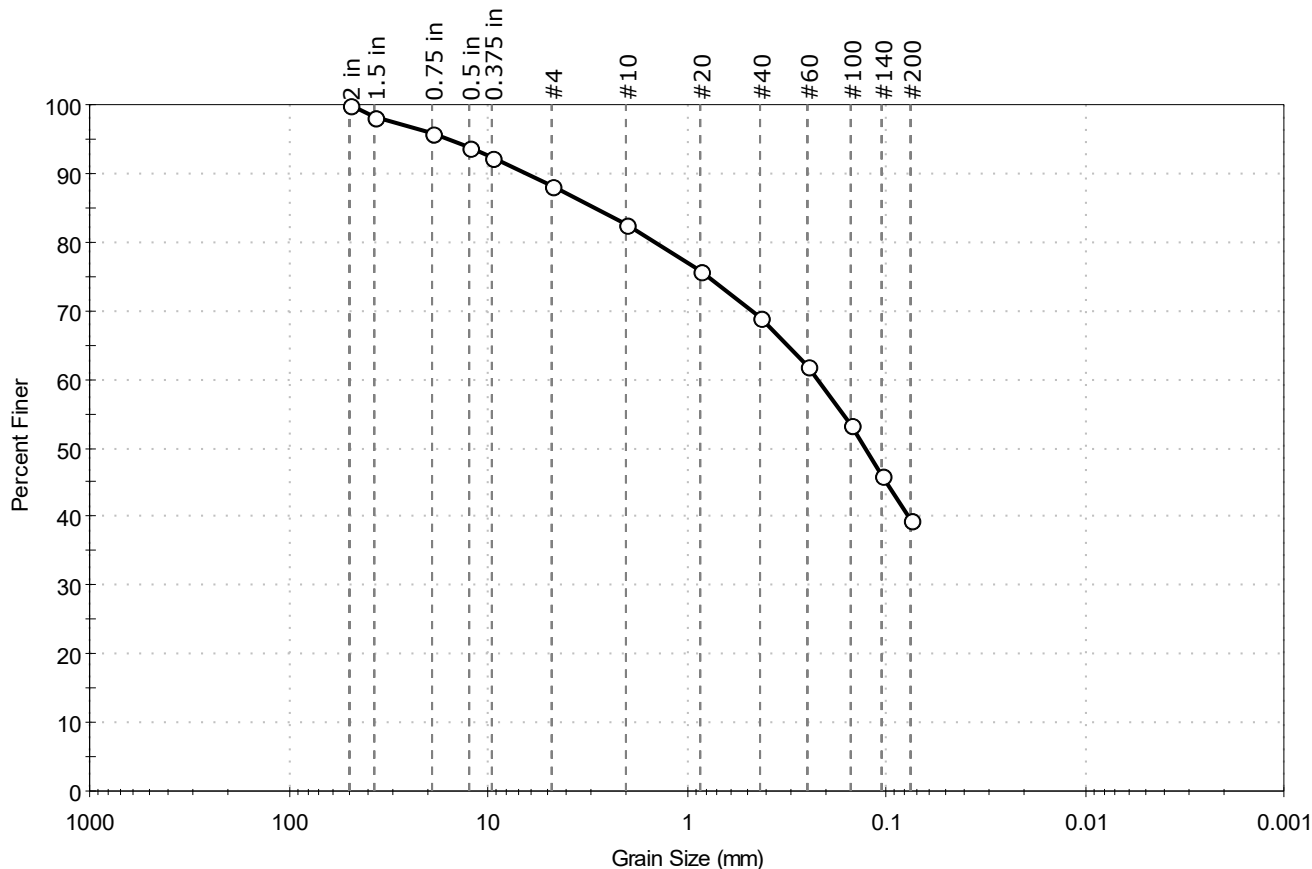
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Client:	Cornerstone Land Consultants		
Project:	Greenmont Commons		
Location:	Dracut, MA	Project No:	GTX-316104
Boring ID:	TP #1	Sample Type:	bucket
Sample ID:	---	Test Date:	09/26/22
Depth :	---	Test Id:	686183
Test Comment:	---		
Visual Description:	Moist, light yellowish brown silty sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	11.8	48.7	39.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
2 in	50.00	100		
1.5 in	37.50	98		
0.75 in	19.00	96		
0.5 in	12.50	94		
0.375 in	9.50	92		
#4	4.75	88		
#10	2.00	83		
#20	0.85	76		
#40	0.42	69		
#60	0.25	62		
#100	0.15	53		
#140	0.11	46		
#200	0.075	40		

Coefficients

$D_{85} = 2.8746 \text{ mm}$ $D_{30} = \text{N/A}$
 $D_{60} = 0.2220 \text{ mm}$ $D_{15} = \text{N/A}$
 $D_{50} = 0.1274 \text{ mm}$ $D_{10} = \text{N/A}$
 $C_u = \text{N/A}$ $C_c = \text{N/A}$

Classification

ASTM N/A

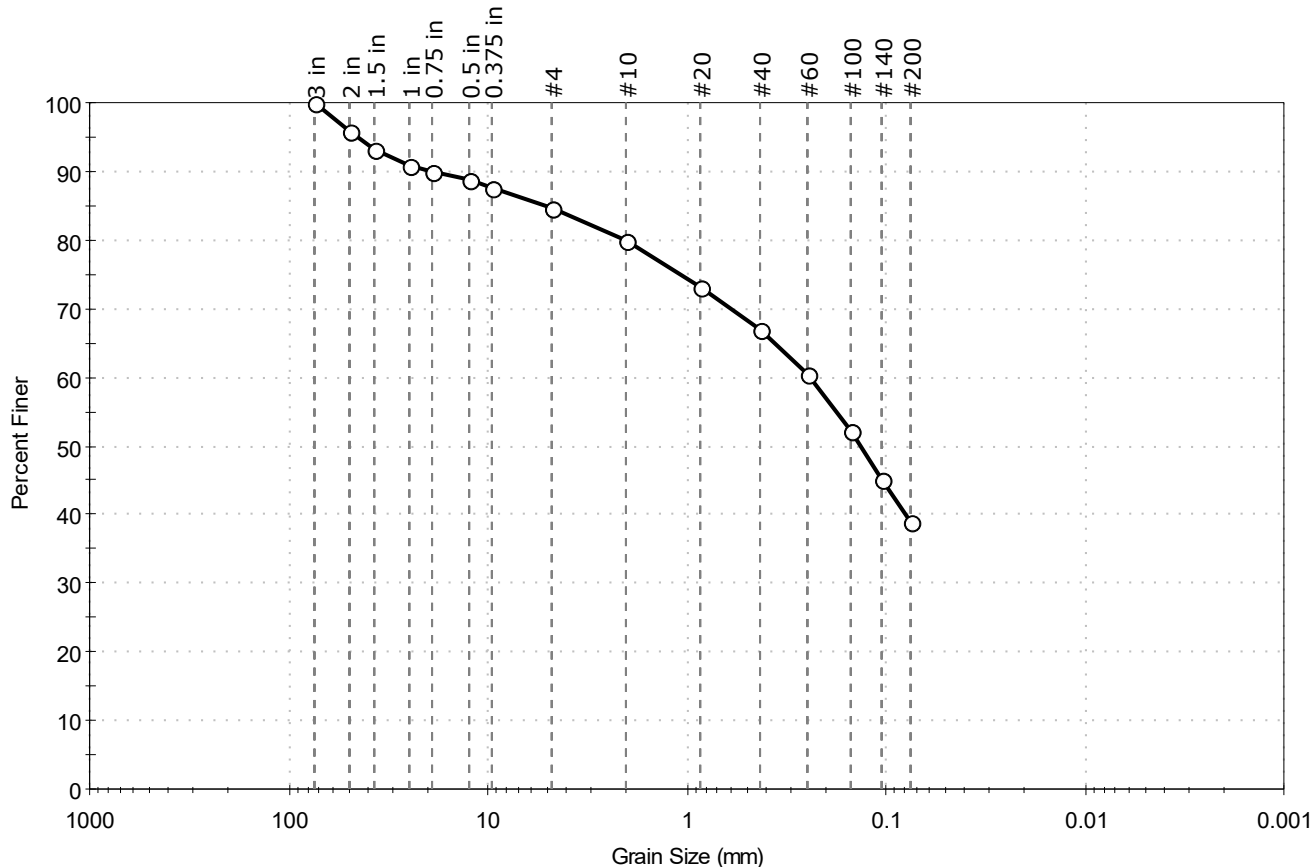
AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR
 Sand/Gravel Hardness : HARD

Client:	Cornerstone Land Consultants		
Project:	Greenmont Commons		
Location:	Dracut, MA	Project No:	GTX-316104
Boring ID:	TP #2	Sample Type:	bucket
Sample ID:	---	Test Date:	09/28/22
Depth :	---	Checked By:	jsc
		Test Id:	686184
Test Comment:	---		
Visual Description:	Moist, light olive brown silty sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	15.4	45.6	39.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	96		
1.5 in	37.50	93		
1 in	25.00	91		
0.75 in	19.00	90		
0.5 in	12.50	89		
0.375 in	9.50	88		
#4	4.75	85		
#10	2.00	80		
#20	0.85	73		
#40	0.42	67		
#60	0.25	60		
#100	0.15	52		
#140	0.11	45		
#200	0.075	39		

Coefficients

$D_{85} = 5.2042 \text{ mm}$ $D_{30} = \text{N/A}$
 $D_{60} = 0.2449 \text{ mm}$ $D_{15} = \text{N/A}$
 $D_{50} = 0.1347 \text{ mm}$ $D_{10} = \text{N/A}$
 $C_u = \text{N/A}$ $C_c = \text{N/A}$

Classification

ASTM N/A

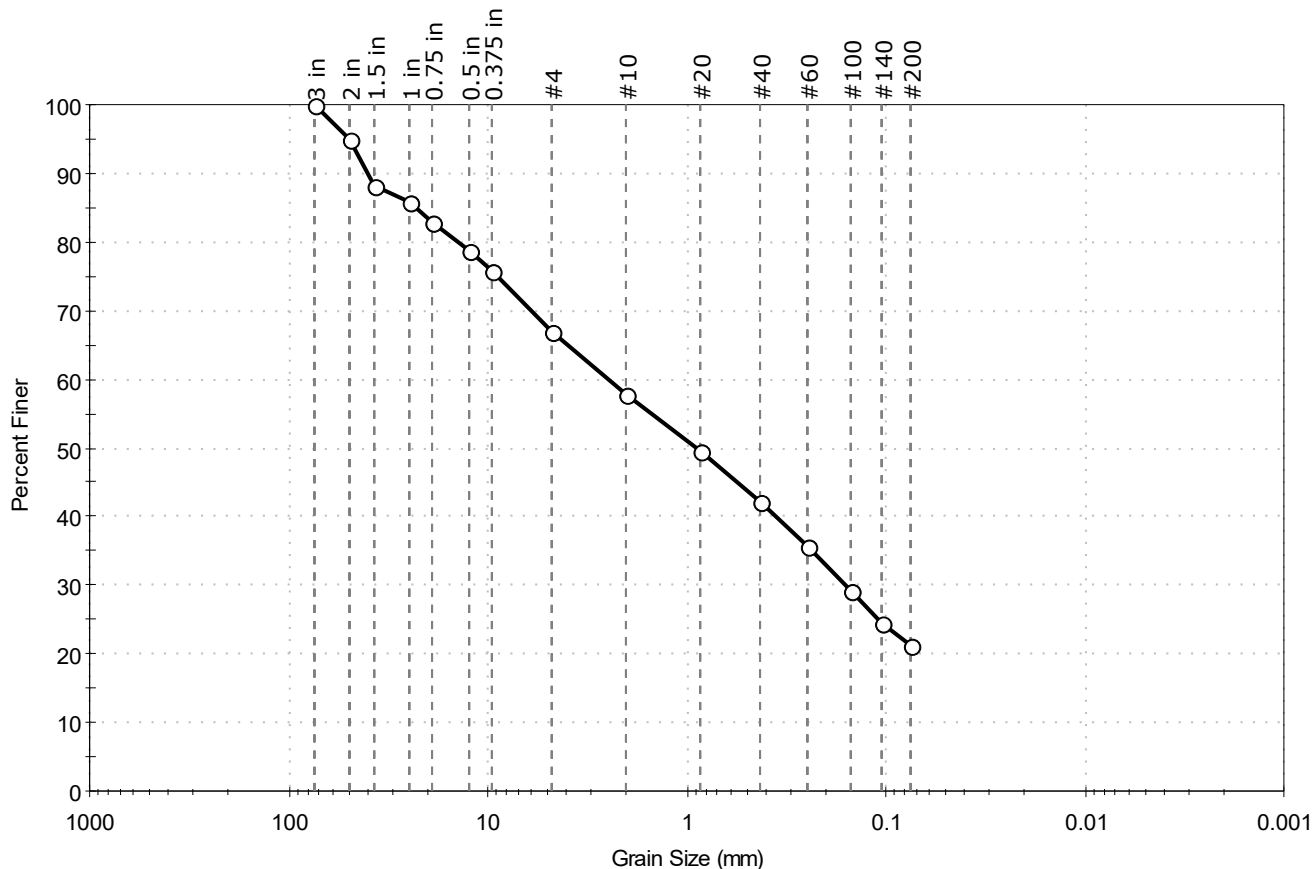
AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR
 Sand/Gravel Hardness : HARD

Client:	Cornerstone Land Consultants		
Project:	Greenmont Commons		
Location:	Dracut, MA	Project No:	GTX-316104
Boring ID:	TP #3	Sample Type:	bucket
Sample ID:	---	Test Date:	09/27/22
Depth :	---	Checked By:	jsc
		Test Id:	686185
Test Comment:	---		
Visual Description:	Moist, dark yellowish brown silty sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	32.9	45.8	21.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	95		
1.5 in	37.50	88		
1 in	25.00	86		
0.75 in	19.00	83		
0.5 in	12.50	79		
0.375 in	9.50	76		
#4	4.75	67		
#10	2.00	58		
#20	0.85	50		
#40	0.42	42		
#60	0.25	36		
#100	0.15	29		
#140	0.11	24		
#200	0.075	21		

Coefficients

$D_{85} = 23.0906$ mm $D_{30} = 0.1587$ mm
 $D_{60} = 2.4279$ mm $D_{15} = \text{N/A}$
 $D_{50} = 0.8828$ mm $D_{10} = \text{N/A}$
 $C_u = \text{N/A}$ $C_c = \text{N/A}$

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR
 Sand/Gravel Hardness : HARD

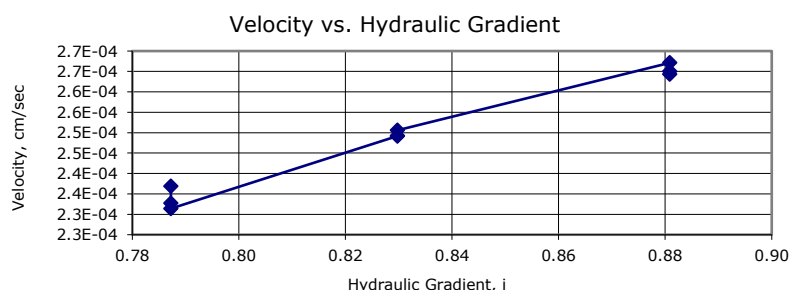


Client:	Cornerstone Land Consultants		
Project Name:	Greenmont Commons		
Project Location:	Dracut, MA		
GTX #:	316104		
Start Date:	09/30/22	Tested By:	awp
End Date:	10/04/22	Checked By:	jsc
Boring #:	TP-1		
Sample #:	---		
Depth:	---		
Visual Description:	Moist, light yellowish brown silty sand		

Permeability of Granular Soils (Constant Head) by ASTM D2434

Sample Type:	Remolded																																			
Sample Information:	Maximum Dry Density:	---	pcf																																	
	Optimum Moisture Content:	---	%																																	
	Compaction Test Method:	---																																		
	Classification (ASTM D2487):	---																																		
	Assumed Specific Gravity:	2.65																																		
Sample Preparation / Test Setup:	Test specimen compacted with moderate effort at air-dried moisture content. Material >3/4-inch removed from sample prior to testing (4.1% of sample).																																			
<table border="1"> <thead> <tr> <th>Parameter</th><th>Initial</th><th>Final</th></tr> </thead> <tbody> <tr> <td>Height, in</td><td>12.00</td><td>11.75</td></tr> <tr> <td>Diameter, in</td><td>9.50</td><td>9.50</td></tr> <tr> <td>Area, in²</td><td>70.9</td><td>70.9</td></tr> <tr> <td>Volume, in³</td><td>850.6</td><td>832.9</td></tr> <tr> <td>Mass, g</td><td>23931</td><td>---</td></tr> <tr> <td>Bulk Density, pcf</td><td>107</td><td>---</td></tr> <tr> <td>Moisture Content, %</td><td>1.2</td><td>---</td></tr> <tr> <td>Dry Density, pcf</td><td>106</td><td>---</td></tr> <tr> <td>Degree of Saturation, %</td><td>---</td><td>---</td></tr> <tr> <td>Void Ratio, e</td><td>---</td><td>---</td></tr> </tbody> </table>				Parameter	Initial	Final	Height, in	12.00	11.75	Diameter, in	9.50	9.50	Area, in ²	70.9	70.9	Volume, in ³	850.6	832.9	Mass, g	23931	---	Bulk Density, pcf	107	---	Moisture Content, %	1.2	---	Dry Density, pcf	106	---	Degree of Saturation, %	---	---	Void Ratio, e	---	---
Parameter	Initial	Final																																		
Height, in	12.00	11.75																																		
Diameter, in	9.50	9.50																																		
Area, in ²	70.9	70.9																																		
Volume, in ³	850.6	832.9																																		
Mass, g	23931	---																																		
Bulk Density, pcf	107	---																																		
Moisture Content, %	1.2	---																																		
Dry Density, pcf	106	---																																		
Degree of Saturation, %	---	---																																		
Void Ratio, e	---	---																																		

Date	Reading #	Volume of Flow, cc	Time of Flow, sec	Flow Rate, cc/sec	Gradient	Permeability, cm/sec	Temp., °C	Correction Factor	Permeability @ 20 °C, cm/sec
10/4	1	3.3	31	0.11	0.79	3.0E-04	18.4	1.041	3.1E-04
10/4	2	3.2	30	0.11	0.79	3.0E-04	18.4	1.041	3.1E-04
10/4	3	3.2	30	0.11	0.79	2.9E-04	18.4	1.041	3.1E-04
10/4	4	3.5	31	0.11	0.83	3.0E-04	18.4	1.041	3.1E-04
10/4	5	3.5	31	0.11	0.83	3.0E-04	18.4	1.041	3.1E-04
10/4	6	3.5	31	0.11	0.83	3.0E-04	18.4	1.041	3.1E-04
10/4	7	3.7	31	0.12	0.88	3.0E-04	18.5	1.038	3.1E-04
10/4	8	3.7	30	0.12	0.88	3.0E-04	18.5	1.038	3.1E-04
10/4	9	3.7	30	0.12	0.88	3.0E-04	18.5	1.038	3.1E-04



PERMEABILITY @ 20 °C =

3.1×10^{-4} cm/sec

PERMEABILITY @ 20 °C =

3.1×10^{-6} m/sec

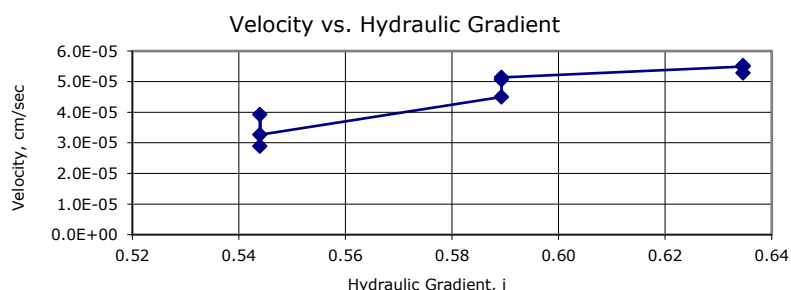


Client:	Cornerstone Land consultants		
Project Name:	Greenmont Commons		
Project Location:	Dracut, MA		
GTX #:	316104		
Start Date:	09/30/22	Tested By:	awp
End Date:	10/06/22	Checked By:	jsc
Boring #:	TP-2		
Sample #:	---		
Depth:	---		
Visual Description:	Moist, light olive brown silty sand with gravel		

Permeability of Granular Soils (Constant Head) by ASTM D2434

Sample Type:	Remolded																																			
Sample Information:	Maximum Dry Density:	---	pcf																																	
	Optimum Moisture Content:	---	%																																	
	Compaction Test Method:	---																																		
	Classification (ASTM D2487):	---																																		
	Assumed Specific Gravity:	2.65																																		
Sample Preparation / Test Setup:	Test specimen compacted with moderate effort at air-dried moisture content. Material >3/8-inch removed from sample prior to testing (7% of sample).																																			
<table border="1"> <thead> <tr> <th>Parameter</th><th>Initial</th><th>Final</th></tr> </thead> <tbody> <tr> <td>Height, in</td><td>10.65</td><td>11.03</td></tr> <tr> <td>Diameter, in</td><td>9.50</td><td>9.50</td></tr> <tr> <td>Area, in²</td><td>70.9</td><td>70.9</td></tr> <tr> <td>Volume, in³</td><td>754.9</td><td>781.8</td></tr> <tr> <td>Mass, g</td><td>20807</td><td>---</td></tr> <tr> <td>Bulk Density, pcf</td><td>105</td><td>---</td></tr> <tr> <td>Moisture Content, %</td><td>0.0</td><td>---</td></tr> <tr> <td>Dry Density, pcf</td><td>105</td><td>---</td></tr> <tr> <td>Degree of Saturation, %</td><td>---</td><td>---</td></tr> <tr> <td>Void Ratio, e</td><td>---</td><td>---</td></tr> </tbody> </table>				Parameter	Initial	Final	Height, in	10.65	11.03	Diameter, in	9.50	9.50	Area, in ²	70.9	70.9	Volume, in ³	754.9	781.8	Mass, g	20807	---	Bulk Density, pcf	105	---	Moisture Content, %	0.0	---	Dry Density, pcf	105	---	Degree of Saturation, %	---	---	Void Ratio, e	---	---
Parameter	Initial	Final																																		
Height, in	10.65	11.03																																		
Diameter, in	9.50	9.50																																		
Area, in ²	70.9	70.9																																		
Volume, in ³	754.9	781.8																																		
Mass, g	20807	---																																		
Bulk Density, pcf	105	---																																		
Moisture Content, %	0.0	---																																		
Dry Density, pcf	105	---																																		
Degree of Saturation, %	---	---																																		
Void Ratio, e	---	---																																		

Date	Reading #	Volume of Flow, cc	Time of Flow, sec	Flow Rate, cc/sec	Gradient	Permeability, cm/sec	Temp., °C	Correction Factor	Permeability @ 20 °C, cm/sec
10/5	1	4.0	300	0.01	0.54	5.3E-05	19.8	1.005	5.3E-05
10/5	2	5.4	300	0.02	0.54	7.2E-05	19.8	1.005	7.2E-05
10/5	3	4.5	300	0.01	0.54	6.0E-05	19.8	1.005	6.0E-05
10/5	4	6.2	300	0.02	0.59	7.6E-05	19.5	1.013	7.7E-05
10/5	5	6.9	300	0.02	0.59	8.6E-05	19.5	1.013	8.7E-05
10/5	6	7.0	300	0.02	0.59	8.7E-05	19.5	1.013	8.8E-05
10/5	7	7.5	300	0.03	0.63	8.7E-05	19.4	1.015	8.8E-05
10/5	8	7.6	300	0.03	0.63	8.7E-05	19.4	1.015	8.8E-05
10/5	9	7.3	300	0.02	0.63	8.3E-05	19.4	1.015	8.5E-05



PERMEABILITY @ 20 °C =
 7.8×10^{-5} cm/sec

PERMEABILITY @ 20 °C =
 7.8×10^{-7} m/sec

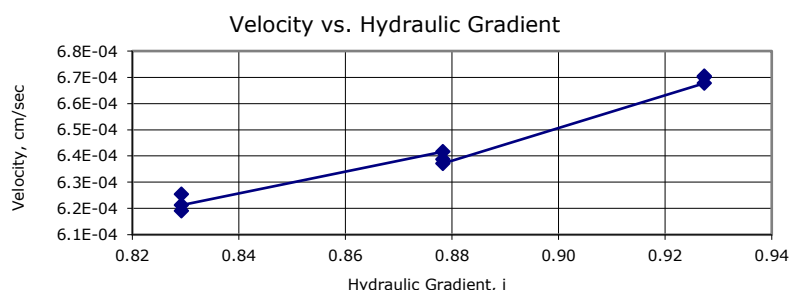


Client:	Conerstone Land Consultants		
Project Name:	Greenmont Commons		
Project Location:	Dracut, MA		
GTX #:	316104		
Start Date:	09/30/22	Tested By:	awp
End Date:	10/06/22	Checked By:	jsc
Boring #:	TP-3		
Sample #:	---		
Depth:	---		
Visual Description:	Moist, dark yellowish brown sand with gravel		

Permeability of Granular Soils (Constant Head) by ASTM D2434

Sample Type:	Remolded																																			
Sample Information:	Maximum Dry Density:	---	pcf																																	
	Optimum Moisture Content:	---	%																																	
	Compaction Test Method:	---																																		
	Classification (ASTM D2487):	---																																		
	Assumed Specific Gravity:	2.65																																		
Sample Preparation / Test Setup:	Test specimen compacted with moderate effort at air-dried moisture content. Material >3/4-inch removed from sample prior to testing (17.2% of sample).																																			
<table border="1"> <thead> <tr> <th>Parameter</th><th>Initial</th><th>Final</th></tr> </thead> <tbody> <tr> <td>Height, in</td><td>10.04</td><td>10.19</td></tr> <tr> <td>Diameter, in</td><td>9.50</td><td>9.50</td></tr> <tr> <td>Area, in²</td><td>70.9</td><td>70.9</td></tr> <tr> <td>Volume, in³</td><td>711.7</td><td>722.3</td></tr> <tr> <td>Mass, g</td><td>20380</td><td>---</td></tr> <tr> <td>Bulk Density, pcf</td><td>109</td><td>---</td></tr> <tr> <td>Moisture Content, %</td><td>2.9</td><td>---</td></tr> <tr> <td>Dry Density, pcf</td><td>106</td><td>---</td></tr> <tr> <td>Degree of Saturation, %</td><td>---</td><td>---</td></tr> <tr> <td>Void Ratio, e</td><td>---</td><td>---</td></tr> </tbody> </table>				Parameter	Initial	Final	Height, in	10.04	10.19	Diameter, in	9.50	9.50	Area, in ²	70.9	70.9	Volume, in ³	711.7	722.3	Mass, g	20380	---	Bulk Density, pcf	109	---	Moisture Content, %	2.9	---	Dry Density, pcf	106	---	Degree of Saturation, %	---	---	Void Ratio, e	---	---
Parameter	Initial	Final																																		
Height, in	10.04	10.19																																		
Diameter, in	9.50	9.50																																		
Area, in ²	70.9	70.9																																		
Volume, in ³	711.7	722.3																																		
Mass, g	20380	---																																		
Bulk Density, pcf	109	---																																		
Moisture Content, %	2.9	---																																		
Dry Density, pcf	106	---																																		
Degree of Saturation, %	---	---																																		
Void Ratio, e	---	---																																		

Date	Reading #	Volume of Flow, cc	Time of Flow, sec	Flow Rate, cc/sec	Gradient	Permeability, cm/sec	Temp., °C	Correction Factor	Permeability @ 20 °C, cm/sec
10/6	1	34.3	120	0.29	0.83	7.5E-04	18.6	1.036	7.8E-04
10/6	2	34.5	122	0.28	0.83	7.5E-04	18.6	1.036	7.7E-04
10/6	3	38.0	134	0.28	0.83	7.5E-04	18.6	1.036	7.8E-04
10/6	4	35.6	121	0.29	0.88	7.3E-04	18.6	1.036	7.6E-04
10/6	5	35.2	121	0.29	0.88	7.3E-04	18.6	1.036	7.5E-04
10/6	6	41.5	142	0.29	0.88	7.3E-04	18.6	1.036	7.5E-04
10/6	7	39.8	130	0.31	0.93	7.2E-04	18.4	1.041	7.5E-04
10/6	8	38.2	125	0.31	0.93	7.2E-04	18.4	1.041	7.5E-04
10/6	9	41.2	134	0.31	0.93	7.2E-04	18.4	1.041	7.5E-04



PERMEABILITY @ 20 °C =

7.6×10^{-4} cm/sec

PERMEABILITY @ 20 °C =

7.6×10^{-6} m/sec